

# Environmental and Natural Resources Technology (CIP 03.0101 / 03.0102)

## Occupational Skills

**The student demonstrates the specified level of competency in occupational skills.**

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>No Exposure</b>	<b>Introduced</b>	<b>Practiced</b>	<b>Entry Level</b>	<b>Competency</b>

## Environmental and Natural Resources Technology

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|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| <b>0</b>                 | <b>1</b>                 | <b>2</b>                 | <b>3</b>                 | <b>4</b>                 |  |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |
- A. Core**  
**Conduct Water Quality Studies**  
 (VT Framework: 1.3, 1.8, 1.10, 1.17, 1.18, 1.21, 2.1, 2.2, 2.3, 7.13 ccc., 7.18)
- B. Apply Wastewater Treatment Methods**  
 (VT Framework: 1.10, 1.18, 1.19, 1.20, 2.3, 2.5, 7.13 bbb., 7.18)
- C. Demonstrate Effective Solid and Hazardous Waste Management** (VT Framework: 1.13, 1.18, 1.19, 7.15 eee., 7.16 dd., 7.18 bb.)
- D. Perform Forest Management Tasks**  
 (VT Framework: 1.13, 2.5, 7.13 ccc., 7.15 eee., 7.16 aaa.)
- E. Apply Wildlife Management**  
 (VT Framework: 1.13, 1.19, 1.22, 2.1, 7.13 bbb., 7.15 eee.)
- F. Conduct Air Quality Management Studies**  
 (VT Framework: 1.5, 1.8, 2.2, 2.5, 7.15 ccc., eee., 7.18 bb.)

### Specialization Options (Choose One of Two Options)

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|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| <b>0</b>                 | <b>1</b>                 | <b>2</b>                 | <b>3</b>                 | <b>4</b>                 |  |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  |
- A. Environmental Technology Specialization**  
**Operate and Calibrate Lab and field Instruments**  
 (VT Framework: 1.18, 2.5, 7.13 ccc., 7.18)
- B. Perform Advanced Sampling Technique and Analysis**  
 (VT Framework: 1.8, 1.17, 1.18, 1.20, 2.5, 7.13 bbb., ccc., 7.15 aaa., 7.17 bb., 7.18, 7.19)
- C. Inspect Water, Air, and Soil Sampling Equipment, Perform Maintenance**  
 (VT Framework: 7.17 bb., 7.18 bb., 7.19)
- D. Monitor Groundwater**  
 (VT Framework: 7.15 aaa., 7.18 aaa., 7.14)

- ☐☐☐☐☐ **E. Comply with Current Waste Management Practices and Laws Applicable to Groundwater**  
(VT Framework: 1.3, 7.13 bbb., 7.15 eee.)
- ☐☐☐☐☐ **F. Develop Site Safety Programs**  
(VT Framework: 2.4)
- ☐☐☐☐☐ **G. Perform Environmental Site Assessments**  
(VT Framework: 1.5, 1.6 aa., 1.21, 2.3, 7.13 ccc., 7.19)
- ☐☐☐☐☐ **H. Analyze Municipal Solid Waste Plans**  
(VT Framework: 2.1, 7.16 dd, 7.17 ddd, 7.19)
- ☐☐☐☐☐ **I. Design and Operate a Composting Facility**  
(VT Framework: 1.22, 7.13 ddd., 7.15 eee., 7.16 dd., 7.17 ddd., 7.19)
- ☐☐☐☐☐ **J. Identify Smog Related Issues**
- ☐☐☐☐☐ **K. Diagnose Indoor Air Pollution**  
(VT Framework: 1..7, 2.4, 2.5, 7.18 bb,)
- ☐☐☐☐☐ **L. Observe Effects of Acid Rain**  
(VT Framework: 7.13 ccc., 7.15 ccc., 7.19)
- 0 1 2 3 4**
- ☐☐☐☐☐ **A. Natural Resources Conservation Specialization Practice Workplace Equipment Safety that Meets Industry Standards**
- ☐☐☐☐☐ **B. Identify Recreational Area Environmental Management Principles**  
(VT Framework: 2.1, 7.15 eee., 7.19)
- ☐☐☐☐☐ **C. Manage Endangered Species**  
(VT Framework: 1.13, 7.15 aaa., 7.19)
- ☐☐☐☐☐ **D. Establish and Manage Wildlife Habitat**  
(VT Framework: 1.17, 7.13 bbb., ccc., 7.15 aaa., eee.)
- ☐☐☐☐☐ **E. Manage Animal Wildlife**  
(VT Framework: (7.13 aaa., bbb., ccc., 7.15 eee., 7.19)
- ☐☐☐☐☐ **F. Manage Plant Wildlife**  
(VT Framework: 7.13 aaa., bbb., 7.19)
- ☐☐☐☐☐ **G. Harvest and Process Timber**  
(VT Framework: 7.16 aaa.)
- ☐☐☐☐☐ **H. Apply Surveying and Mapping Skills**  
(VT Framework: 1.17, 7.15 aaa., 7.17 bb., 7.18 bb.)
- ☐☐☐☐☐ **I. Operate and Maintain Forestry / Conservation Equipment**  
(Vermont Framework: 7.18)
- ☐☐☐☐☐ **J. Apply Best Management Practices to Conserve Soil and Water**  
(Vermont Framework: 2.1, 7.18 bb.)

### Directions

Evaluate the student by checking the appropriate box to indicate the degree of competency. The rating for each competency should reflect **employability readiness** rather than the grades given in class.

#### Rating Scale:

- 0 No exposure**  
**1 Introduced** – the student has been exposed through non-participatory instruction (e.g. lecture, demonstration, field trip, video)  
**2 Practiced** – the student can perform the task with direct supervision.  
**3 Entry-Level Competency** – the student can perform the task with limited supervision and/or does not perform the task to standards (a typical entry-level performance expectation).  
**4 Competency** – the student consistently performs task to standards with no supervision (on at least two occasions or at instructor's option).

### Environmental and Natural Resources Technology Core

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#### A. Conduct Water Quality Studies

- A.001 Identify common threats to groundwater and surface water.  
A.002 Identify different types of soils.  
A.003 Select best management practices for maintaining water quality.  
A.004 Identify constituents in effluent and affects on water quality.  
A.005 Demonstrate managing and remediation of water pollution.

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#### B. Apply Wastewater Treatment Methods

- B.001 Identify basic characteristics and principles of wastewater treatment.  
B.002 Demonstrate sampling techniques and sample interpretation.  
B.003 Use mathematics to solve problems common in wastewater treatment – facility operations.  
B.004 Identify basic characteristics and principles of wastewater treatment.

	B.005	Demonstrate process of preliminary, primary, secondary, and tertiary treatments.
0 1 2 3 4 □□□□□	C.	<b>Demonstrate Effective Solid and Hazardous Waste Management</b>
	C.001	Describe regulations that govern hazardous wastes.
	C.002	Describe permitting processes for hazardous waste facilities.
	C.003	Perform the packaging of hazardous wastes (Lab Packs).
	C.004	Describe regulations that govern disposal of solid wastes.
	C.005	Develop recycling programs.
	C.006	Demonstrate an understanding of landfill operations.
0 1 2 3 4 □□□□□	D.	<b>Perform Forest Management Tasks</b>
	D.001	Identify tree species (using twigs, bark, ...).
	D.002	Estimate volume of standing trees with a Biltmore/International or Vermont stick, tally sheet, and volume tables.
	D.003	Be familiar with the multi-use concept of forest management.
	D.004	Demonstrate knowledge of the selection of harvesting systems, according to state standards (Best Management Practice).
	D.005	Develop recycling programs.
0 1 2 3 4 □□□□□	E.	<b>Apply Wildlife Management Skills</b>
	E.001	Identify wildlife management principles.
	E.002	Identify recreational area environmental management principles.
	E.003	Show interconnections in a food web.
	E.004	Demonstrate knowledge of the predator/prey relationship.
	E.005	Distinguish between the types of birds.
	E.006	Distinguish between small mammals and large mammals.
	E.007	List major fish species.
0 1 2 3 4 □□□□□	F.	<b>Conduct Air Quality Management Studies</b>

- F.001 Assess environmental effects of air pollution.
- F.002 Interpret air pollutants and their health hazards.
- F.003 Determine composition and percentage of air components (unpolluted).
- F.004 Describe climate change (Greenhouse Effect).

### **Environmental Technology Specialty**

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#### **A. Operate and Calibrate Lab and Field Instruments**

- A.001 Follow established methodology.
- A.002 Follow equipment operating instructions.
- A.003 Prepare equipment.
- A.004 Prepare reagents and standards.
- A.005 Perform physical tests.
- A.006 Centrifuge samples.
- A.007 Titrate samples.
- A.008 Pipette solutions.
- A.009 Perform serial dilutions.
- A.010 Perform analytic dilutions.
- A.011 Operate testing equipment.
- A.012 Perform plate counts.
- A.013 Perform gram stains
- A.014 Analyze slides.
- A.015 Store samples.

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#### **B. Perform Advanced Sampling Techniques and Analysis**

- B.001 Keep a field diary.
- B.002 Determine reason for sample.
- B.003 Define risks associated with sampling.
- B.004 Identify equipment needed.
- B.005 Perform sampling protocol.
- B.006 Identify proper testing procedures.

- B.007 Analyze samples.
- B.008 Interpret test results.
- B.009 Maintain required records.

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**C. Inspect Water, Air and Soil Sampling Equipment and Perform Preventive Maintenance**

- C.001 Start a maintenance record-keeping system that provides information to protect equipment warranties, to prepare budgets and to satisfy regulatory agencies.
- C.002 Recognize symptoms that indicate equipment is not performing properly, identify source of the problem, and take corrective action.
- C.003 Perform maintenance as directed by manufacturers.
- C.004 Determine when assistance is required to correct a problem.

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**D. Monitor Groundwater**

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**E. Comply with Current Waste Management Practices and Laws Applicable to Protecting Groundwater**

- E.001 Understand state DEP regulations.
- E.002 Understand federal EPA regulations.
- E.003 Understand contractual agreements.

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**F. Develop Site Safety Programs**

- F.001 Use spill clean-up kits.
- F.002 Identify incompatible combinations of chemicals that could result in potentially dangerous situations.
- F.003 Present safety information in a clear and concise manner.
- F.004 Understand “Right to Know”.
- F.005 Understand health risks.
- F.006 Understand emergency procedures.

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**G. Perform Environmental Site Assessments**

- G.001 Design an investigation.
- G.002 Identify information needed.
- G.003 Read blueprints, schematics and maps.
- G.004 Collect information.
- G.005 Collect samples.
- G.006 Analyze samples.
- G.007 Process data.
- G.008 Write technical reports.

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**H. Analyze Municipal Solid Waste Plans**

- H.001 Understand organizational structure.
- H.002 Identify types of waste.
- H.003 Receive materials.
- H.004 Sort, compact, load materials.
- H.005 Process recyclables.
- H.006 Collect garbage, yard waste, recyclables, hazardous waste, and biomedical waste.

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**I. Design and Operate a Composting Facility**

- I.001 Understand the biology, chemistry, and physics of composting.
- I.002 Design and construct indoor and outdoor bioreactors.
- I.003 Operate worm composting and thermophilic (“hot”) composting.
- I.004 Determine the best mix of composting ingredients.
- I.005 Monitor the composting process and test the properties of finished compost.
- I.006 Determine the effects of compost on plant growth.

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**J. Identify Smog Related Issues**

- J.001 Determine air quality standards.
- J.002 Collect air samples.
- J.003 Analyze samples for presence of pollution.
- J.004 Describe remediation processes.

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**K. Diagnose Indoor Air Pollution**

- K.001 Determine nature and extent of exposure.
- K.002 Determine applicable regulations.
- K.003 Assess equipment and processes.
- K.004 Develop sampling strategy.
- K.005 Determine appropriate sampling/analytical techniques.
- K.006 Collect representative air samples.
- K.007 Submit samples for analysis.
- K.008 Evaluate lab results.
- K.009 Recommend corrective actions.
- K.010 Develop written report.

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**L. Observe Effects of Acid Rain**

- L.001 Monitor acid precipitation.
- L.002 Compare vegetation in soils that have natural buffering capacity with less buffered soils.
- L.003 Show the effects of acidic depositions on humans.

**Natural Resources Conservation Specialty**

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**A. Practice Work Place/Equipment Safety That Meets Industry Safety Standards**



- A.001 Use appropriate clothing, shoes/boots, safety glasses, ear protection, breathing apparatus, shields, and other safety equipment.
- A.002 Follow appropriate fire safety practices.
- A.003 Follow appropriate first aid procedures.
- A.004 Follow proper hazardous chemical/material control procedures, being aware of the “Right to Know” regulations.
- A.005 Use required tools and equipment in a safe manner.
- A.006 Identify unsafe conditions and follow emergency procedures.

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**B. Identify Recreational Area Environmental Management Principles**

- B.001 Identify kinds of outdoor recreation in Vermont.
- B.002 Distinguish between consumptive and non-consumptive recreational uses of natural resources.
- B.003 Show the economic and environmental impact of outdoor recreation.
- B.004 Determine best management practices that will improve the environment for outdoor recreation.

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**C. Manage Endangered Species**

- C.001 Identify animal and plant wildlife endangered species in Vermont.
- C.002 Understand Federal and State Endangered Species in Vermont.
- C.003 Demonstrate knowledge of how wildlife becomes endangered.
- C.004 Identify best practices to improve and protect endangered species.

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**D. Establish and Manage Wildlife Habitat**

- D.001 Determine habitat requirements.
- D.002 Establish habitat management goals.
- D.003 Determine sources of habitat pollution and destruction.
- D.004 Demonstrate practices that prevent habitat pollution.

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**E. Manage Animal Wildlife.**

- E.001 Understand animal biological systems and needs.
- E.002 Develop habitat that meets species requirements.

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**F. Manage Plant Wildlife**

- F.001 Understand plant biological systems and needs.
- F.002 Develop habitat that benefits wild plants.
- F.003 Balance forest management with animal wildlife and human resource needs.
- F.004 Promote the production of browse, herbage, and mast.

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**G. Harvest and Process Timber**

- G.001 Demonstrate knowledge of the selection of harvesting systems, according to state standards (Best Management Practices).
- G.002 Identify logs and lumber.
- G.003 Perform safe felling procedures.
- G.004 Measure, grade, and buck tree length logs, according to industry standards.
- G.005 Tally and scale lumber, according to industry standards (NELMA).
- G.006 Operate chain saws in a safe manner to manufacturers' specifications.

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**H. Apply Surveying and Mapping Skills**

- H.001 Use scales, rulers, compasses, stereoscope, and other instruments.
- H.002 Use topographic maps and aerial photographs.
- H.003 Measure acreage and distance.
- H.004 Read and interpret map symbols and scales.
- H.005 Use surveying equipment such as a hand or staff compass, and transit or level (including state of the art surveying equipment.)
- H.006 Locate corners, boundary lines and bench marks on a piece of land.

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**I. Operate and Maintain Forestry/Conservation Equipment**

- I.001 Safely maintain the proper hand and power tools for specific jobs.
- I.002 Service gasoline (2 and 4 cycle) and diesel engines to manufacturer's specifications.
- I.003 Maintain chain saws in a safe manner to manufacturer's specifications.

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**J. Apply Best Management Practices to Conserve Soil and Water**

- J.001 Identify and assess types of soil erosion.
- J.002 Select specific state-approved methods for controlling soil erosion (water bars, check dams, silt fencing,...)
- J.003 Illustrate current environmental regulations that impact on forestry practices.
- J.004 Illustrate common water conservation practices (sod water ways, tile drainage, diversion ditches, field drainage ditches,...).
- J.005 identify agencies and organizations which provide assistance with soil and water conservation practices.
- J.006 Determine acceptable management practices for maintaining water quality on logging operations.